Nonlinear Observer Design in the Siegel Domain

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Abstract
We extend the method of Kazantzis and Kravaris for the design of an observer to a larger class of nonlinear systems. The extended method is applicable to any real analytic observable nonlinear system. It is based on the solution of a first-order nonlinear PDE. This solution yields a change of state coordinates which linearizes the error dynamics. Under very general conditions, the existence and uniqueness of the solution is proved. Siegel’s theorem is obtained as a corollary. The technique is constructive and yields a method for constructing approximate solutions.

Keywords: Nonlinear systems, Nonlinear observers, Linearizable Error Dynamics, Output Injection, Siegel domains.